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National Micro Vision Systems, Inc.

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Federal Communications Commission
Office of the Secretary

23 June 1992

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
1919 M Street, N. W.
Washington, D. C. 20554

Re: Notice of Proposed Rulemaking, PR Docket No. 92-80

Dear Ms. Searcy,

Enclosed please find the original plus nine copies of our comments related to the referenced NPRM.

Very truly yours,
NATIONAL MICRO VISION SYSTEMS, INC.

Michael Lynch
President

ML/le

cc. Enclosures

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 1, 2, and	)	PR Docket No. 92-80
21 of the Commission's Rules	)	RM 7909
Governing Use of the Frequencies	)	
in the 2.1 and 2.5 GHz Bands	)	

NOTICE OF PROPOSED RULEMAKING

Adopted: April 9, 1992 Released: May 8, 1992

National Micro Vision Systems, Inc. (NMVS) is a company directly involved in the development of wireless cable in the United States. It feels that the growth of the industry would be encouraged by a streamlined regulatory process that recognized the unique characteristics of MDS/MMDS/ITFS transmission.

Therefore, in response to the Federal Communications Commission Notice of Proposed Rulemaking, dated April 9, 1992, National Micro Vision Systems, Inc. respectfully submits the following comments:

Background:

1. **MDS/MMDS is a de facto broadcast service** in the sense that it generally "provides an omni-directional, one-way transmission of information for simultaneous reception at multiple fixed points within the station's service area." 1/

2. **The FCC has sought to promote MDS/MMDS as a competitor to cable television** delivery by enhancing "the potential of wireless cable as a competitive force in the multichannel video distribution marketplace". 2/ The delivery service,

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1/ FCC Notice of Proposed Rulemaking, PR Docket No. 92-80, RM 7909, released May 8, 1992, page 1, Section II, paragraph 2.

2/ FCC Second Report and Order, General Docket 90-54, released Oct. 25, 1991, page 2, Section I, paragraph 1.

using MDS/MMDS frequencies, has become known as "wireless cable".

3. **The FCC has already taken explicit and specific regulatory steps** to improve/enhance the competitivness of "wireless cable". Recently it has allowed wireless cable entities to apply directly for licensing of unused ITFS channels and has allowed wireless cable entities to lease unused, or little used, already licensed ITFS channels for commercial purposes. 3/

4. **The FCC has witnessed the near total failure of single channel MDS** (operation at 2150-2162 MHz) as a commercial enterprise. This failure was due to various reasons, e.g. low channel capacity, uncompetitive cost structure, the unnecessary added complication of common carrier status mandated by government regulation, etc.

5. **Potential ITFS users and existing ITFS licensees have not effectively utilized** the 200 MHz of spectrum allocated for ITFS even with a favorable atmosphere of government grants to promote "distance education". Many ITFS systems which have been built have been poorly engineered, improperly installed, casually operated, and ineffectively employed for education.

Discussion:

6. **Any new regulations must promote wireless cable and anticipate technical advances.**

The FCC has specifically selected MDS/MMDS to provide competition to cable television systems where they exist and to provide high quality, multiple channel video distribution to the public where cable does not exist.

To achieve the desired level of competition, MDS/MMDS must be subjected to a no more severe regulatory environment than cable is.

Television transmission technology is on the threshold of major advances in the areas of high definition, digital transmission, and data compression. New regulations promulgated by the FCC must not restrict, limit, or inhibit the application of new technology and should anticipate these advances.

For example, the FCC is nearing a decision on standards for high definition TV. HDTV transmission will be essential

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3/ FCC Second Report and Order, General Docket 90-54, released Oct. 25, 1991, pages 18 - 28, Section II, paragraphs 42-58.

to wireless cable systems who wish to remain competetive. The FCC must anticipate transmission and interference requirements for HDTV and incorporate these into any forthcoming rule changes for MDS/MMDS/ITFS.

7. **Wireless cable licensing should consist of two steps: technical evaluation for compliance to FCC regulations and a public auction.**

The FCC should select a processing procedure for MDS/MMDS and ITFS applications that insures compliance with the interference requirements that the Commission has established and provides stability to the industry. Regulatory flip-flops occuring every several years do not create an atmosphere conducive to attracting the financing essential to growth of the wireless cable industry.

A reasonable and expeditious approach to processing applications would involve two steps. Applications would be accepted for a period of say 90 days following FCC acceptance of the first application for a service area.

First, each application should be examined to verify that it complies with all FCC technical standards and requirements.

Secondly, each compliant applicant would then be invited to participate in an auction. The FCC would set a minimum bid that would be related to the population in the service area covered by the application. Technically compliant applicants would then bid for the award of the license with construction to be completed within one year of grant of a construction permit.

Failure to complete construction within the one year period would result in forfeiture of the construction permit and of any monies paid at the auction.

Such forfeiture would cause the FCC to again accept applications for the service area, thus restarting the technical verification/auction/construction permit/license sequence.

This approach would allow the market place to determine the value of a license and sharply reduce speculative activity by applicants whose only financial committment is to pay an FCC filing fee.

8. **The FCC, rather than restrict MDS/MMDS operators to small service areas, should make available to them all of the**

"economies of scale" that are available to cable system operators. Thus the goal of the FCC should be the maximization of the service area and minimum restriction of networking technologies such as CARS band signal networking commonly used by cable MSO's.

9. **Where "wireless cable" operates in direct competition with cable, it must offer equal or better programming with equal to or better delivered signal quality** to the public at rates comparable to those offered by the existing cable systems. Thus in areas where cable exists, the practical maximum cost and minimum technical and service standards to a wireless cable subcriber have already been set by the existing cable service.

To create regulatory structures and restrictions which result in making the construction of wireless systems less cost effective destroys the ability of wireless to compete with cable.

10. **The FCC is committing a serious and grave philosophical and technical error by making analogies between MDS/MMDS and cellular radio service,** which are two distinctly different services. 4/ The following factors must be considered:

a) The driving force behind cellular technology is maximization of channel capacity through frequency re-use and other technologies. This is accomplished by intentionally restricting propagation of the radio signal, i.e. by limiting cell size, and results in the very expensive repetition of cellular sites and equipment (infrastructure). The balance between infra-structure cost and capacity was intentionally chosen very lopsidedly in favor of capacity.

b) The factors which determine the economic viability of cellular are totally and completely different than MDS/MMDS. Cellular systems compete against other cellular systems which use the same or nearly the same infrastructure and technology. Prior to the inception of cellular, there was little or no existing rate structure that the general public was preconditioned or prepared to pay.

c) If MDS/MMDS signals are to be restricted to service areas of the same approximate size as cells in the cellular

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4/ "Regulation by analogy" is demonstrated by the proposed Table 1 - Minimum Co-channel Separation Distance", FCC Notice of Proposed Rulemaking, PR Docket No. 92-80, RM 7909, released May 8, 1992, Appendix B, page 8.

service, it will not be an economically viable service. The cost of a cellular site is in the order of $500,000. This cost is roughly comparable to that of a 20 to 30 channel MMDS transmit site.

However, monthly cellular subscriber phone bills typically range from several hundred dollars to several thousand dollars. Yet typical subscriber cable television bills range from $15 to $50 monthly.

The wireless cable industry cannot be required by regulation to proliferate the countryside with half-million dollar transmit sites and expect to be price competitive with the existing cable industry.

If the FCC creates cellular type of licensing/siting restrictions for the MDS/MMDS industry, financial disaster will be the inevitable result, as was the case with single channel MDS in the recent past.

d) At least four major technical differences exist between the cellular service and MDS/MMDS.

First, in cellular the subscriber is usually mobile or portable whereas the MDS/MMDS subscriber is virtually always fixed.

Second, the cellular mobile unit generally employs an omni-directional antenna using vertical polarization. An MDS/MMDS receiver, however, is required by FCC regulation (47 CFR 21.902(f)(3)) to use a high gain, high-directivity, high front-to-back ratio antenna, whose performance is strongly dependent on signal polarization.

Third, cellular, since it is either analog frequency modulation or digital modulation, is less succeptible to noise and interference and can operate satisfactorily at a significantly lower SNR and higher interference levels than analog amplitude modulated video transmission.

Fourth, different techniques are available to minimize/control interference. Frequency offset, cross polarization, directional transmit antennas, and terrain can all be utilized by the MDS/MMDS/ITFS system designer to reduce interference to FCC limits. None of these techniques is available in cellular.

These technical differences, in this author's opinion, preclude the direct transfer of the cellular technical regulatory approach to MDS/MMDS or "regulation by analogy".

11. **The existing FCC standards of 45 dB co-channel desired to undesired signal ratio and 0 dB adjacent channel represent reasonable, practical, calculatable, and measurable interference standards.**

Imposition of these "end result" standards allows the telecommunications engineer the maximum flexibility in designing systems. Many techniques, including directional transmit antennas, terrain features, transmit frequency offset and cross-polarization are available to reduce interference to the FCC limits.

The use of "end result" standards and the financial incentive to an entrepreneur of maximizing a particular service area should result in the greatest coverage by wireless cable systems.

12. **Adoption of a strict 80 km co-channel separation standard is not in the public interest.**

The FCC has proposed the adoption of a strict 80 km (50 mile) co-channel separation. Such adoption is not in the public interest since it would deny a large percentage of the public access to wireless cable.

a) Arbitrary separation standards do not take into consideration actual terrain features upon which the propagation of microwave signals are highly dependent. Terrain blockage by mountains and other natural features can greatly reduce the effective coverage area of MDS/MMDS signals, but can also be used to shield one system from another.

b) Arbitrary separation standards do not take into consideration the public need for service areas. For example, there are many towns located in the midwest that are 35 to 40 miles apart. Strict application of the FCC proposed 48 km adjacent channel/80 km co-channel separation standard would prevent every other city from having access to a wireless cable system or would significantly reduce the number of channels available at any one location, thereby making wireless cable less competitive with cable.

c) Arbitrary separation standards prevent "economies of scale" in which, for example, a wireless operator might make clever use of existing topography to create a "master headend", centrally located amongst a cluster of cities, from which is transmitted to outlying relay transmitters wireless cable signals. (These techniques are directly analogous to

CARS band signal relay techniques used by cable operators to reduce their cost or operations and improve service to their customers.)

d) Imposition of arbitrary separation standards may ease the administrative burden on the FCC but does not serve the public interest, necessity, or convenience in anything approaching an optimum fashion.

Comments made by Commissioner Duggan in his statement of 9 April 1992 with regard to the limitations of "a mileage separation approach" are pertinent, perceptive, and erudite. 5/

13. **Similarly, strict adherence to Metropolitan Statistical Areas (MSA) or Rural Service Areas (RSA) for allocation of MDS/MMDS licenses is unrealistic and a disservice to the public** for all of the reasons stated in paragraph 12 above.

The public is best prepared to determine what areas should be served. The Commission's role should solely be that of referee to provide some minimum level of interference protection.

The Commission's role should not include making business judgements as to what areas should or should not be served.

14. **ITFS applicants have subverted the licensing system.**

While the FCC may have been inundated with a large number of MDS/MMDS license applications, many "prepared by application mills", which it feels are largely "speculative", the FCC must realize that the spirit of the MDS/MMDS/ITFS license process has also been subverted by "educators" of questionable credentials and credibility who sense a commercial value of their poessession of a license but who have no real, sincere desire, interest, or ability to provide the public with worthwhile, effective educational programming. 6/

Similarly, various "carpetbagger" religious educators

5/ FCC Notice of Proposed Rulemaking, PR Docket No. 92-80, RM 7909, released May 8, 1992, Statement of Commissioner Ervin S. Duggan, page 2, paragraph 3.

6/ Tipton, KS is an excellent example of such educational entrepreneurialship. Various educators in this midwestern town of about 350 people have filed applications for six 4-channel ITFS groups.

with no direct affiliation with any local parochial educational institution have offered to lease licensed ITFS channels under terms which deny any of the lease revenues to the local institutions.

One possible way to reduce speculative channel grabbing is for the FCC to require periodic certification by the educational licensee of ITFS frequencies of actual educational programming and actual completion of construction of facilities, both transmitting and receiving. If facilities for which FCC licenses or interference protection have been sought have not been built after a reasonable period, say one year, licenses and protection should automatically be terminated.

Furthermore, renewal of ITFS licenses should be made conditional upon fulfillment of minimum educational broadcasting schedules and actual construction of proposed/claimed facilities.

15. **The technical relationship between 15 mile/24 km radius service area and a maximum permitted MDS/MMDS transmitter EIRP of 33 dBW is not logical and well thought out.** 7/

The transmission objective for delivered signal quality for a wireless cable system should be TASO grade 1 ("excellent") or better in the majority of cases, which is equivalent to a video signal-to-noise ratio of approximately 45 dB. Allowing a 6 dB margin for "problem" installations and assuming a transmitter EIRP of 33 dBW operating into a subscriber antenna having 24 dB gain and a downconverter having a noise figure of 2 dB, the maximum distance from the transmitter to the subscriber is approximately 50 miles.

This well in excess of the 15 mile radius protected service area established by the Commission.

The FCC should either reduce the maximum EIRP to less than 33 dBW or extend the radius of the protected service area.

16. **The Commission has made a technical error in their development of the rationale in the recommendation of the 48**

7/ 47 CFR 21.904(a). In fact, subparagraph (b) allows the EIRP to be increased by up to 6 dB in certain directions for directional antennas. See also FCC Notice of Proposed Rulemaking, PR Docket No. 92-80, RM 7909, released May 8, 1992, page 7, footnote 23.

km adjacent channel coordination distance. 8/

Considering a potential receiving site located equidistant from two MDS/MMDS transmitters separated 48 km, the power flux density of the signals from each of the two transmit locations would be equal.

However due to the highly directional properties of the MDS/MMDS/ITFS receive antenna as required by FCC regulation, the co-channel interference, which is defined as "the ratio of the desired signal to the undesired signal present in the desired channel, at the output of a reference antenna oriented to receive the maximum desired signal" (47 CFR 21.902(f)(.1)) would not be 0 dB, but would be -25 dB for co-polarized or -45 dB for cross-polarized signals, assuming receive antenna performance in accordance with 47 CFR 21.902(f)(3). (This corresponds to Receive Site A of Figure 1.)

In fact, the worst case location for a receiver from an adjacent channel interference point of view, assuming no terrain blockage or other unusual propagation conditions, is at the intersection of the 24 km radius circle centered on the transmitter from which the receiver is receiving the desired signal and a line joining the two transmitters but at a point farthest from the interfering transmitter. (This corresponds to Receive Site B of Fig. 1.) At this point no interference-reducing benefit of the high front-to-back ratio of the receive antenna is obtained.

17. **The short spacing table proposed by the FCC 9/ is technically incorrect because of underlying technical assumptions are technically incorrect.** (See paragraphs 10 and 16 above.)

18. ***Current FCC regulations with respect to interference are ambiguous and should be clarified.***

Current FCC regulations are inconsistent in their definition of interference. 47 CFR 74.903(a) speaks of harmful interference based only on free space calculations whereas subparagraph (1) of the same section defines co-channel interference as "the ratio of the desired to the

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8/ FCC Notice of Proposed Rulemaking, PR Docket No. 92-80, RM 7909, released May 8, 1992, page 7, footnote 24.

9/ FCC Notice of Proposed Rulemaking, PR Docket No. 92-80, RM 7909, released May 8, 1992, Appendix B, page 8.

undesired signal, at the antenna input terminals of the affected receiver".

The actual interference ratio also depends on other factors such as terrain, foilage, etc. which are not considered when a calculation is solely based on free space loss. 10/

This ambiguity should be resolved in favor of the actual signal ratio which is likely to exist at the affected receiver antenna terminals. This is a more realistic approach in that more than just free space attenuation (we understand this to mean beam spreading loss) can occur in practical situations.

For example, an installer would naturally position and orient a receiving antenna so that the desired signal would be subjected to minimum terrain and foilage losses, whereas the undesired signal would probably be subjected to these losses to a greater extent.

19. **The top curve of Figure 1, 47 CFR 21.902(f)(3), is improperly labelled.** It is currently labelled "plane polarized", but should be labelled with the correct term "co-polarized." The figure, to be more nearly technically complete, should indicate that linear polarization is assumed. 11/

20. **Simultaneous transmission on both linear polarizations is wasteful of a valuable resource and should be prohibited.**

The FCC should realize that the use of cross polarization is an effective tool in minimizing interference into nearby MDS/MMDS systems. Faraday rotation is not a serious problem in the 2 GHz frequency band allowing the full polarization isolation of the receive antenna to be realized.

However MDS/MMDS systems have been proposed and licensed in the past which simultaneously use both horizontal and vertical polarizations on the same frequency from the same transmit site. This represents a squandering of an important resource.

11/ This ambiguity is repeated in 47 CFR 21.902(f)(1).

11/ This same incorrect labelling occurs in Figure 1, 47 CFR 74.937(a).

The FCC should ban the practise of any one system simultaneously using both horizontal and vertical polarizations for transmission of the same signal from any one location.

21. **Frequency offset is a proven technique which should be codified in the regulations.**

The FCC should also realize that the use of transmit frequency offset is an effective tool in minimizing interference into adjacent MDS/MMDS systems, providing up to an additional 17 dB in interference reduction.

The FCC should specifically include frequency offset in its regulations along with pertinent technical standards and allowable interference improvement factors. MDS/MMDS/ITFS interference requirements should be reduced by these inprovement factors.

22. The FCC should consider the use of private enterprise in expeditiously processing the backlog of MMDS applications. This is probably the most efficient solution to the backlog problem while maintaining the technical integrity of the licensing process.

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The above comments have been prepared on behalf of National Micro Vision Systems, Inc. by Galen F. Tustison, Registered Professional Engineer (California registration number E-7121) and holder of an FCC General Telephone License number.

Galen F. Tustison
Consulting Engineer
Ramona, California

Date: 24 June 1992